Published in final edited form as:

J Psychosom Res. 2017 February ; 93: 41–47. doi:10.1016/j.jpsychores.2016.12.004.

Telephone-Administered versus Live Group Cognitive Behavioral Stress Management for Adults with CFS

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Abstract

Objective—Chronic Fatigue Syndrome (CFS) symptoms have been shown to be exacerbated by stress and ameliorated by group-based psychosocial interventions such as cognitive behavioral stress management (CBSM). Still, patients may have difficulty attending face-to-face groups. This study compared the effects of a telephone-delivered (T-CBSM) vs a live (L-CBSM) group on perceived stress and symptomology in adults with CFS.

Methods—Intervention data from 100 patients with CFS (mean age 50 years; 90% female) participating in T-CBSM (N = 56) or L-CBSM (N = 44) in previously conducted randomized clinical trials were obtained. Perceived Stress Scale (PSS) and the Centers for Disease Control and Prevention symptom checklist scores were compared with repeated measures analyses of variance in adjusted and unadjusted analyses.

Results—Participants across groups showed no differences in most demographic and illness variables at study entry and had similar session attendance. Both conditions showed significant reductions in PSS scores, with L-CBSM showing a large effect (partial $\epsilon^2=.16$) and T-CBSM a medium effect (partial $\epsilon^2=.095$). For CFS symptom frequency and severity scores, L-CBSM

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Conflicts of Interest: The authors report no conflicts of interest.

Trial Registration: NIH 5R01NS055672

reported large effect size improvements (partial $\epsilon^2=.19-.23$), while T-CBSM showed no significant changes over time.

Conclusions—Two different formats for delivering group-based CBSM—live and telephone—showed reductions in perceived stress among patients with CFS. However, only the live format was associated with physical symptom improvements, with specific effects on post-exertional malaise, chills, fever, and restful sleep. The added value of the live group format is discussed, along with implications for future technology-facilitated group interventions in this population.

Keywords

CFS; perceived stress; cognitive behavioral stress management; symptoms; post-exertional malaise; telehealth

Introduction

Chronic Fatigue Syndrome (CFS) is a disorder with no established etiology characterized primarily by severe, debilitating chronic fatigue as well as post-exertional malaise and multi-system flu-like symptoms [1, 2]. This disorder is frequently associated with comorbidities that collectively result in decrements in social, occupational, emotional, and physical functioning [3]. Patients with CFS often report high levels of emotional distress, and the majority of patients evidence marked dysfunctions in nervous, endocrine, and immune system functioning [2–5]. CFS has prevalence in the United States as high as 2.54%, the majority of whom are females [2, 5]. Due to loss in household and work productivity, the economic burden of CFS in the U.S. is estimated to be between \$9.1 Billion and \$23.9 Billion annually in direct and indirect costs [6–8]. Collectively, CFS is an illness with severe and debilitating consequences for patients, their families, and society at large.

Stress could be a suitable target for psychosocial interventions aiming to reduce the burden of this onerous illness. Biopsychosocial conceptualizations of CFS symptoms emphasize the centrality of stress-related processes [9–11]. Evidence, primarily from observational studies, suggests that the ability to cope with stress is associated with physical and mental health outcomes among patients with CFS. For instance, CFS symptom severity is known to worsen in response to extreme environmental stressors [12] and to improve with greater perceived stress management skills and stress management intervention [13, 14]. Furthermore, early life adversity is highly prevalent in ME [11, 15], and has been associated with alterations in neuroendocrine functioning [11] that may worsen key CFS symptoms such as post-exertional malaise [16]. Thus, interventions aiming to decrease patients' stress levels and physical symptoms are of critical importance.

Among treatments available for CFS, behavioral approaches have garnered much attention. Cognitive behavioral therapy (CBT) is among the most widely studied and has shown mixed results for reducing illness burden and improving patients' mental and physical health [17–22]. CBT approaches designed to decrease avoidance of physical activity and to increase physical activity in a graded fashion in patients with chronic fatigue [21], have generated much current interest, though controversy remains concerning the sampling approach and outcome variables used in these studies [23, 24]. Whether this form of CBT will ultimately

show to be efficacious in patients diagnosed with CFS remains to be seen, though it should be pointed out that reviews of CBT-based interventions used to date in this population do not support increases in physical activity as the underlying mechanism of action. To the extent that stress processes, including neuroimmune regulation, may maintain or exacerbate the CFS symptomology [11, 13, 16], it is plausible that cognitive behavioral interventions that focus more directly on stressor processing and stress responses may also modulate CFS symptoms.

Another approach, referred to as cognitive behavioral stress management (CBSM) [9, 25], which directly targets stress management by teaching cognitive re-structuring, coping skills, interpersonal skills, relaxation, and other anxiety reduction techniques in a group format, was shown to improve quality of life and decrease perceived stress and symptoms among CFS patients [14]. In that trial, patients who attended sessions benefited from the live group intervention; however, many patients were unable to commit to the requirement of attending these sessions. Since CFS patients' fatigue levels can impede their ability to attend in-person sessions [26], telephone-administered CBSM may be particularly suited to the needs of this population. Telephone-administered individual CBT has been shown to have less attrition than face-to-face CBT, with comparable post-treatment improvements in depressed mood among patients with depression [27]. It is unclear whether these effects would have been comparable in a group format or among patients with a chronic medical condition such as CFS.

To date, no study of patients with CFS has evaluated whether telephone-administered group-based CBSM (T-CBSM) improves patients' stress levels and symptoms relative to live group CBSM (L-CBSM). The present study is a secondary analysis of data from two separate trials, which aims to compare the differential effects of L-CBSM versus T-CBSM on perceived stress and physical symptoms.

Method

Data was obtained from two intervention trials that were identical with respect to principal investigator, intervention material, and geographic location. The first trial compared approximately 3 months of L-CBSM to a one-day Live Self-Help psycho-education condition [14]. The second trial compared an approximately 3-month (10 weekly sessions) T-CBSM to 10 weekly sessions of telephone-delivered Health Education. Both studies were approved by the local university Institutional Review Board. In this report, pre-intervention baseline assessment and post-intervention data are compared from participants in the two stress management conditions —T-CBSM and L-CBSM.

Eligibility

For both trials, written informed consent was obtained from eligible participants. Participants were required to have a physician-determined CFS diagnosis based on the Fukuda et al. [2] definition and be fluent in English. Potential participants were excluded from both studies if they were diagnosed with an illness or were receiving medical treatment that would explain chronic fatigue and/or modulate the immune system (e.g., a diagnosis of Lyme disease, cancer, HIV/AIDS, autoimmune disease, or treatment with renal dialysis or

medications such as corticosteroids). Other relevant exclusion criteria across trials include a prior psychiatric hospitalization for a thought disorder or affective disorder, a history of substance or drug abuse within 2 years of their CFS diagnosis, and a history of major psychiatric illness such as schizophrenia.

For the L-CBSM trial, participants were required to be between 18 and 60 years of age and have at least an eighth grade education. For the T-CBSM trial, which involved a larger sample, participants were required to be between 21 and 75 years of age and, due to the nature of the intervention, to have a landline telephone at home. There was not an education requirement for the T-CBSM trial, but potential participants could be excluded if they made four or more errors on the Short Portable Mental Status Questionnaire as this error rate indicates a high likelihood that the individual is of diminished cognitive capabilities.

Randomization

For the L-CBSM trial, participants were randomized to treatment condition using a 2:1 ratio for L-CBSM to control upon completion of baseline assessment. A 2:1 ratio was used to ensure that there was a sufficient sample size to conduct within group analyses in the experimental condition. For the T-CBSM trial, participants were randomized to treatment condition using a 1:1 ratio upon completion of baseline assessment. Other than these procedural differences the screening and assessment procedures for the two trials were the same.

Descriptions of Live- and Telephone-CBSM Interventions

For both the L-CBSM and T-CBSM interventions, each session consisted of a relaxation training exercise and a didactic portion focused on CBSM techniques. Trained clinicians who held a graduate-level mental health degree led the sessions. Relaxation training exercises included diaphragmatic breathing, progressive muscle relaxation, and guided imagery. Cognitive behavioral techniques taught in session included cognitive restructuring, assertiveness training, anger management training, and the use of effective coping strategies.

For the L-CBSM trial, the intervention included 12 weekly in-person group meetings. For the T-CBSM trial, the intervention included 10 weekly group meetings held via telephone. Both intervention arms covered the same topics, but the L-CBSM's two additional sessions provided additional time to review coping and cognitive restructuring skills. Sessions ranged in duration from 90 – 120 minutes. Participants in the T-CBSM condition received a Cidco Model: CST2100 desk set screen telephone during their participation in the study. Each telephone was programmed with a Computer-Telephone Integration System (CTIS), which allows for the delivery of voice and text information using standard telephone lines, and does not require the addition of a new telephone number. For participants with conflicting schedules and who were not at home during the time of the conference call, a toll-free number was established to give them the flexibility to call from another location and participate in the group sessions.

Measures

Demographic information—All participants provided demographic data detailing age, gender, race/ethnicity, marital status, number of children, years of formal education, and employment status. Categorical variables (education, race/ethnicity, marital status, and employment) were dichotomized as follows: completed college (yes/no); self-identified as non-Hispanic White (yes/no); married or in a committed partnership (yes/no); and employed full-time (yes/no). Time since their initial CFS diagnosis was also recorded as an indicator of illness duration.

Perceived Stress—The Perceived Stress Scale (PSS) [28] was used to measure participants' perceptions of life stress at pre and post-intervention. Participants were prompted to indicate how often they felt or thought a certain way in the last week (0 = never to 4 = very often) on 14 items. Sample items include “How often have you been upset because something happened unexpectedly?” and “How often have you felt confident about your ability to handle your personal problems?” Items stated in a positive manner were reverse scored and a total score was calculated by summing items (range = 0 to 56). This measure has demonstrated excellent internal consistency ($\alpha = .84 - .86$ in past studies), and is associated with a wide range of self-reports of stress [28, 29].

CFS Symptoms—The CDC CFS Symptom Inventory [30] was used to measure the presence of CFS symptoms in participants' lives over the past month at the pre- and post-intervention time points. Participants were prompted to rate the frequency (0 = none of the time to 4 = all of the time) and severity (0 = not at all to 3 = very severe) of 19 CFS-related symptoms. The symptoms surveyed include the case definition symptoms as defined by Fukuda et al. [2]. Demonstrated internal consistency among the case definition symptoms ($\alpha = .82$) and among the other symptoms ($\alpha = .74$) has been excellent, and the measure has been shown to be a reliable indicator of CFS symptoms [30]. In the T-CBSM trial, response ranges for frequency and severity were presented on a 6-point scale (0 to 5) and were thus converted using a linear transformation to the Wagner et al. response ranges. Total symptom frequency (range = 0 to 36) and severity (range = 0 to 27) scores were computed by summing the nine CFS symptoms comprising the Fukuda et al. criteria. Individual symptom frequency and severity levels were also examined over time.

Data Analysis Plan

Statistical analyses were performed using SPSS version 22.0. All variables were examined for normality within and collapsing across study arms. Descriptive statistics were calculated for all demographic and outcome variables. Demographic variables were analyzed for group differences between the study arms at baseline using independent-samples t-tests, analyses of variance (ANOVAs), and Pearson Chi-square tests.

ANOVAs compared pre and post intervention levels in outcome variables within each study arm. A series of repeated-measures analyses of variance (RANOVAs) were run with treatment arm as the between-subjects factor (one study arm vs. another) and time (pre vs. post-intervention) as the within-subjects factor. For each RANOVA, time and group-by-time effects are reported. Effect sizes were also calculated for all ANOVAs and RANOVAs, and

partial eta-squared values were interpreted using adopted conventions (i.e., .01 = small, .06 = medium, .14 = large). Analyses were conducted unadjusted for covariates and then again controlling for session attendance.

Results

Sample Characteristics

Descriptions of samples from both trials are summarized in Table 1. For the L-CBSM trial, of 113 individuals initially recruited, a final sample meeting inclusion criteria consisted of 69 participants: 44 were randomized to the CBSM condition and 25 to the psychoeducation control group. Participants in L-CBSM were mostly women ($n=38$, 86.4%) and had a mean age of 47.18 ($SD=8.31$). They were predominantly Caucasian ($n=35$, 79.5%) and had a high school diploma or greater (95.5%). Participants' employment status included full time (7.2%), unemployed (13.6%), on disability (33.3%), or other (45.9%). Most participants were married or partnered (59.1%) and on average earned \$20,000–\$30,000 annually.

Of the 161 individuals approached to participate in the T-CBSM trial, 117 were enrolled, and 5 dropped out prior to randomization (primarily due to time constraints). The final sample included 56 participants were randomized to receive T-CBSM and 55 to the psychoeducation control group. The majority of T-CBSM participants were women ($n=52$; 92.9%) and identified as non-Hispanic White ($n=43$; 76.8%). The average age was 50.70 years ($SD=11.08$). Most participants were married or in a monogamous relationship (51.8%) and had at least a college degree (53.6%). Employment status included full time (7.9%), unemployed (14.3%), on disability (41.2%), or other (36.6%). Approximately one-third (31.6%) of participants earned less than \$30,000 annually, and one-third (33.3%) earned more than \$60,000 annually.

The L-CBSM and T-CBSM groups were similar on all demographic characteristics. Illness duration was equivalent as well, with time since diagnosis averaging approximately 10 years within each sample. For L-CBSM, 38/44 (86%) participants provided T2 data, while 46/56 (82%) participants in T-CBSM provided T2 data. Of the six participants who did not provide data in L-CBSM, all six were lost to follow-up. Of the 10 participants who did not provide data in T-CBSM, four declined to participate, four were lost to follow-up and two missed the T2 assessment but were in contact with study staff at a later date.

Comparative Effects of L-CBSM versus T-CBSM

The efficacy of the L-CBSM intervention among this sample of patients with CFS has been previously demonstrated. The focus of the present analyses was to compare the relative effects of L-CBSM versus T-CBSM on perceived stress and CFS symptoms pre-post-intervention. The findings are presented with the understanding that the two intervention conditions differed in total number of sessions offered (L-CBSM: 12; T-CBSM: 10). However, the average number of attended sessions was not different for L-CBSM ($M=9.15$, $SD=2.90$) and T-CBSM participants ($M=8.18$, $SD=1.99$), $p=.09$. Moreover, controlling for attendance in analyses of group comparisons did not change the direction or significance of effects.

Effects on Perceived Stress—Descriptive data on perceived stress levels are presented in Table 2, and results of ANOVAs and RANOVAs are presented in Table 3. Tests of L-CBSM versus T-CBSM showed a combined time effect ($p<.01$) but no group-by-time effect ($p=.89$), suggesting these groups both reduced perceived stress levels. However, effect sizes were large for L-CBSM (partial $\epsilon^2=.16$) while only medium for T-CBSM (partial $\epsilon^2=.095$).

Effects on CFS Symptoms—A total of nine CFS symptoms from the CDC CFS Symptom Inventory that map onto the CDC criteria [2] were assessed for frequency and severity. For descriptive purposes, summary data on total composite scores are presented in Table 2. Although the groups were not different on illness duration or disability status, at baseline the L-CBSM group had higher symptom frequency ($M_{\text{difference}}=7.61$, $SE=1.11$, 95% $CI=5.44-9.78$, $p<.001$) as compared to the T-CBSM group. No difference was observed in baseline symptom severity ($M_{\text{difference}}=1.51$, $SE=0.89$, 95% $CI=-0.24-3.26$, $p=.09$). Results of ANOVAs and RANOVAs for composites are summarized in Table 3. There was a significant group-by-time effect for both symptom frequency ($p=.01$) and severity ($p=.001$). L-CBSM but not T-CBSM led to reduced symptomatology with large effects for frequency (partial $\epsilon^2=.19$) and severity (partial $\epsilon^2=.23$).

Analyses of individual symptoms revealed a similar pattern (see Table 4). Significant group-by-time effects emerged for the frequency of PEM [$F(1,88)=7.84$, $p=.006$, partial $\epsilon^2=.08$], fever [$F(1,88)=8.327$, $p=.005$, partial $\epsilon^2=.09$], chills [$F(1,88)=9.0$, $p=.004$, partial $\epsilon^2=.09$], and unrefreshing sleep [$F(1,88)=4.73$, $p=.032$, partial $\epsilon^2=.05$]. In each case L-CBSM showed a significant reduction in symptom frequency (p 's=.01 to .001; partial $\epsilon^2=.14-.25$) as compared to no changes in T-CBSM. Significant group-by-time effects were also found for severity of tender lymph nodes ($p=.015$, partial $\epsilon^2=.065$), PEM ($p=.033$, partial $\epsilon^2=.05$), chills ($p=.035$, partial $\epsilon^2=.05$) and unrefreshing sleep ($p=.048$, partial $\epsilon^2=.044$). Again, L-CBSM revealed a significant reduction in the severity of these symptoms (p 's=.046 to .003; partial $\epsilon^2=.09-.18$) compared to no changes in T-CBSM. Effects on PEM and unrefreshing sleep severity, among the most common CFS symptoms [31], are plotted in Figures 1 and 2. Again, results were unaffected by controlling for session attendance.

Discussion

This report examined the comparative efficacy of two group-based CBSM interventions on perceived stress and physical symptoms among adults diagnosed with CFS. As previously demonstrated the live, face-to-face format (L-CBSM) showed a large effect on perceived stress, while telephone delivery (T-CBSM) showed a significant but somewhat smaller stress reduction effect. Importantly, L-CBSM offered added value over T-CBSM in reducing the reported frequency and severity of CFS symptomatology, which coincided with its greater stress reduction effect.

Effect sizes for symptom changes in L-CBSM were large, underscoring the positive effects reported in other trials of face-to-face cognitive behavioral interventions with this population [17–21]. Some have suggested that face-to-face CBT also has the benefit of being more cost-effective than other interventions for CFS, including pharmacological treatment [32–34]. Still, examinations of the feasibility and efficacy of CBT for CFS delivered by clinicians in

primary care settings have produced mixed findings [35–39]. The present study adds to this literature with significant effects of L-CBSM on stress levels, total symptom frequency and severity, as well as individual symptoms such as post-exertional malaise, pain, and sleep quality.

One potential drawback of live group delivery, here and in the prior intervention literature, however, can be an inability to travel to and attend sessions, especially for patients with debilitating fatigue and numerous co-occurring symptoms. In contrast, telephone delivery has been lauded for its potential to address several common barriers to patient care, including logistical concerns (e.g., transportation problems, access to local resources and services, child care, lack of financial resources, busy daily schedule), psychological concerns (e.g., lack of motivation, stigma, body image difficulties), and physical health concerns (e.g., ambulatory difficulties, pain, low energy) [40–42]. For the present analyses, while 39% (44/113) of recruited cases did not meet the inclusion criteria for enrollment in the L-CBSM trial (including the ability to commit to attending weekly in-person sessions) only 27% (44/161) of recruited cases failed criteria (including attending weekly teleconferences) in the T-CBSM trial. It was also found that participants randomized to T-CBSM had marginally higher rates of attendance than those in L-CBSM groups (82% versus 76%), although this difference was not statistically significant.

Putative Mechanisms of Action

Interestingly, controlling for session attendance did not alter the magnitude of the comparative and within-group effects examined. Given that session attendance did not account for the differential efficacy of L-CBSM versus T-CBSM, what other factors might explain the relatively greater effects from L-CBSM?

One potential explanation is the opportunity for visual transactions among live groups and/or via a more intensive social support experience. While telephone-delivered individual therapies have demonstrated efficacy comparable to face-to-face individual therapy in a variety of patient populations [27, 43, 44], including ME/CFS [45], past research on the efficacy of telephone-delivered group psychotherapy has been mixed. Using an individual format in past telephone-delivered therapies may have maximized participants' communication with their therapist and uptake of CBT-related skills. In this study of T-CBSM, participants may have been less engaged during sessions than in L-CBSM, and the study therapist could easily miss this lack of engagement in the absence of visual feedback. If, for instance, a patient was not engaged in a relaxation demonstration, she or he may not have learned the skill or benefited from practicing relaxation, and the T-CBSM therapists were not able to see the patient to provide corrective feedback or further instruction. It is also possible that a significant portion of the relative L-CBSM versus T-CBSM intervention benefit comes from having weekly social support, which may have been more salient for group members seeing each other face-to-face (i.e., in L-CBSM).

Because attending live groups may be a challenge for many CFS patients, future work should explore whether other remote venues that allow for a visual display (e.g., videophones or tablets) are as effective as the live group format. These media could have the benefits of both telephone-delivery (circumventing distance) and face-to-face delivery

(enhancing engagement). Recently, a trial of a tablet-delivered videoconferencing CBSM program for men with prostate cancer demonstrated preliminary efficacy in reducing depressive symptoms and improving relaxation self-efficacy [46]. It will be important for future research to study the acceptability and efficacy of video-enhanced telehealthcare among CFS patients and their medical specialists.

It bears consideration that cognitive behavioral stress management is distinct from the prior CBT studies conducted in CFS in its focus on modifying stress responding (i.e., stress management). For instance, it neither focuses on modifying patients' interpretations of the genesis of their illness nor on potential fear/avoidance of physical activity. It was therefore interesting that the CFS symptoms that were most responsive to L-CBSM included PEM, sleep, and immunologic symptoms (i.e., chills, fever). In terms of biobehavioral processes, recent evidence links CFS illness burden to cytokines that influence B cell maturation (e.g., CD40L), pro-inflammatory (e.g., $\text{INF}\gamma$, IL-1 α , and TNF α) and anti-inflammatory (e.g., IL-1RA and IL-4) cytokines, transcription-related protein NF- κ B, mitochondrial dysfunction, expression of Toll-like receptors on intestinal cells, and to some extent hypocortisolism [47–52]. It will thus be important to evaluate whether the beneficial impact of interventions such as CBSM on specific symptoms in CFS is accompanied by favorable improvements in patients' neuroendocrine and immune function, known to be sensitive to stress reduction. It is plausible that some of the differences in the magnitude of specific symptom reductions between L-CBSM and T-CBSM in the present study were attributable to the inability of the T-CBSM condition to bring about sufficiently large stress reduction or social effects, both of which can have marked influence on neuroimmune processes [53–55] and which may be impacted by interventions such as CBSM [56].

Strengths and Limitations

A strength of this report is the use of data from two randomized-controlled trials examining CBSM effects among patients with CFS. The intervention arms of these studies are highly comparable, with the major difference being the medium of intervention delivery. Given the paucity of funding for research on CFS on the one hand and calls for development of effective treatments on the other [57], this secondary analysis is both practical and timely. Additionally, the demographic makeup of the two intervention groups examined reflected population norms for CFS, as study participants were predominately middle-aged, female and Caucasian [58]. Thus, the comparative effects reported here are generalizable to the majority of CFS patients. However, the low representation of African-American and Latino/a participants as well as those with less education is a limitation, and future studies would benefit from recruitment strategies to enhance enrollment of these groups. Relatedly, as the presence of systemic exertion intolerance disorder (SEID) and myalgic encephalomyelitis (ME) was not assessed, it is unclear whether these results generalize to patients with those conditions. Additionally, examination of longitudinal effects of live and remotely-delivered CBSM are needed to better understand whether the effects observed here persist over time. Indeed, a previous CBT trial for CFS found effects enduring at follow-up assessments 6 months [59] and five years [60] post-intervention. Finally, in addition to obtaining self-report measures, future research should examine comparative effects of behavioral (e.g., return to work full-time), diagnostic (e.g., clinician-confirmed remission of

CFS symptoms), and biological outcomes between in-person and telehealth interventions for CFS.

Conclusion

A secondary analysis compared the effects of two different formats for delivering group-based CBSM—live and telephone—in persons diagnosed with chronic fatigue syndrome (CFS). The live venue showed large effects on perceived stress while the telephone delivery format showed medium stress reduction effects. Only the live format was associated with symptom improvements. Symptoms that appeared most responsive to live CBSM were post-exertional malaise, chills, fever, and restful sleep. The added value of the live group format may be due to a more intensive social support experience or the opportunity for visual transactions with this venue. Because attending live groups is a challenge for CFS patients, future work should explore whether other remote venues that allow for a visual display (e.g., videophones or tablets) are comparably effective to the live group format.

Acknowledgments

Source of Funding: Michael H. Antoni, the principal investigator of this study, as well as Daniel L. Hall, Emily G. Lattie, Sara Czaja, Mary Ann Fletcher, Nancy Klimas, and Dolores Perdomo received funding for this study through the National Institutes of Health (5R01NS055672). DLH was subsequently supported by an institutional National Research Service Award (T32AT000051) from the National Center for Complementary and Integrative Health at the National Institutes of Health.

Abbreviations

ANOVA	analysis of variance
CBSM	cognitive behavioral stress management
CBT	cognitive behavioral therapy
CFS	chronic fatigue syndrome
L-CBSM	live group-based CBSM
PEM	post-exertional malaise
PSS	Perceived Stress Scale
RANOVA	repeated-measures analysis of variance
T-CBSM	telephone-administered group-based CBSM

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Highlights

- L-CBSM and T-CBSM both yielded modest effects on perceived stress (PSS)
- L-CBSM, but not T-CBSM, also demonstrated modest effects on Symptom Severity and Symptom Frequency.
- Future studies should continue to explore ways to offer benefits of L-CBSM to CFS patients via other remote technologies.

Figure 1.
Means and Standard Errors for Post-Exertional Malaise Severity at Pre- and Post-intervention by Group

Figure 2.
Means and Standard Errors for Unrefreshing Sleep Severity at Pre- and Post-intervention by Group

Table 1

Characteristics of the Live-CBSM (L-CBSM) and Telephone-CBSM (T-CBSM) groups

	L-CBSM (n=44)	T-CBSM (n=56)	Test Statistic	P value
Age M (SD)	47.18 (8.31)	50.70 (11.08)	1.21	.274
Gender n (%)				
Male	6 (13.6)	4 (7.1)	1.22	.220
Female	38 (86.4)	52 (92.9)	1.15	.229
Race/Ethnicity n (%)				
White	35 (79.5)	43 (76.8)	.741	.467
Non-White	9 (20.5)	13 (23.3)	.109	.467
Partner Status n (%)				
Partnered	26 (59.1)	29 (51.8)	.531	.545
Non-Partnered	18 (40.9)	27 (48.2)	1.412	.309
Formal Education n (%)				
Some Primary School	2 (4.5)	1 (1.8)	11.51	.074
High School Graduate/GED	1 (2.3)	7 (12.5)	2.70	.104
Trade School Graduate	3 (6.8)	0 (0)	3.94	.082
Some College	11 (25.0)	18 (32.1)	.611	.289
College Graduate	18 (40.9)	14 (25.0)	2.87	.070
Graduate Degree	9 (20.5)	16 (28.6)	.866	.244
Employment n (%)				
Fully Employed	5 (7.2)	9 (7.9)	.020	.571
Unemployed	6 (13.6)	8 (14.3)	.009	.581
Disabled Status n (%)				
	23 (33.3)	47 (41.2)	2.41	.089
Illness Duration (y) M(SD)				
	10.32 (6.69)	10.02 (7.28)	.028	.867

Table 2

Means and Standard Deviations of Perceived Stress and Total Symptom Frequency and Severity by L-CBSM vs T-CBSM conditions

Variable	L-CBSM (n=44)	T-CBSM (n=56)
PSS	Pre=29.22(1.44) Post=27.11(1.65)	Pre=31.91(1.40) Post=29.98(1.35)
Total CFS Symptom Frequency	Pre=25.39 (5.58) Post= 21.00 (10.30)	Pre=17.48 (5.44) Post= 17.08 (6.07)
Total CFS Symptom Severity	Pre=15.27 (4.44) Post=12.39 (6.33)	Pre=13.76 (4.41) Post= 14.07 (4.88)

Note: PSS = Perceived Stress Scale

Table 3

Effects of L-CBSM and T-CBSM on Perceived Stress and Total CFS Symptom Frequency and Severity

Variables	L-CBSM	T-CBSM	L-CBSM vs. T-CBSM	
	Pre vs. Post	Pre vs. Post	Time	Time × Group
PSS	$F(1,36)=6.63$, $p=.01$, partial $\epsilon^2=.16$	$F(1,45)=4.70$, $p=.035$, partial $\epsilon^2=.095$	$F(1,81)=10.679$, $p=.002$, partial $\epsilon^2=.116$	$F(1,81)=0.020$, $p=.889$, partial $\epsilon^2=.000$
Total CFS Symptom Frequency	$F(1,43)=10.13$, $p=.003$, partial $\epsilon^2=.19$	$F(1,45)=.360$, $p=.552$, partial $\epsilon^2=.008$	$F(1,88)=10.043$, $p=.002$, partial $\epsilon^2=.102$	$F(1,88)=6.966$, $p=.010$, partial $\epsilon^2=.073$
Total CFS Symptom Severity	$F(1,43)=12.83$, $p=.001$, partial $\epsilon^2=.23$	$F(1,45)=.360$, $p=.551$, partial $\epsilon^2=.008$	$F(1,88)=7.360$, $p=.008$, partial $\epsilon^2=.077$	$F(1,88)=11.342$, $p=.001$, partial $\epsilon^2=.114$

Note: PSS = Perceived Stress Scale

Table 4

Effects of L-CBSM and T-CBSM on Individual CFS Symptom Frequency and Severity Scores

	L-CBSM	T-CBSM	
Variables	Pre vs. Post	Pre vs. Post	Time × Group
Sore throat Frequency	$F(1,43)=1.28, p=.26$ partial $\eta^2=.03$	$F(1,45)=.042, p=.839$ partial $\eta^2=.001$	$F(1,88)=.602, p=.440$ partial $\eta^2=.007$
Sore throat Severity	$F(1,43)=3.63, p=.06$ partial $\eta^2=.08$	$F(1,45)=.198, p=.658$ partial $\eta^2=.004$	$F(1,88)=2.921, p=.091$ partial $\eta^2=.032$
Tender Lymph Nodes Frequency	$F(1,43)=3.18, p=.08$ partial $\eta^2=.07$	$F(1,45)=.277, p=.601$ partial $\eta^2=.006$	$F(1,88)=1.188, p=.279$ partial $\eta^2=.013$
Tender Lymph Nodes Severity	$F(1,43)=5.39, p=.03$ partial $\eta^2=.11$	$F(1,45)=1.380, p=.246$ partial $\eta^2=.030$	$F(1,88)=6.126, p=.015$ partial $\eta^2=.065$
Diarrhea Frequency	$F(1,43)=0.24, p=.62$ partial $\eta^2=.01$	$F(1,45)=.000, p=1.00$ partial $\eta^2=.000$	$F(1,88)=.191, p=.663$ partial $\eta^2=.002$
Diarrhea Severity	$F(1,43)=2.18, p=.15$ partial $\eta^2=.05$	$F(1,45)=.122, p=.729$ partial $\eta^2=.003$	$F(1,88)=.775, p=.381$ partial $\eta^2=.009$
PEM Frequency	$F(1,43)=7.13, p=.01$ partial $\eta^2=.14$	$F(1,45)=1.478, p=.0230$ partial $\eta^2=.032$	$F(1,88)=7.843, p=.006$ partial $\eta^2=.082$
PEM Severity	$F(1,43)=4.24, p=.046$ partial $\eta^2=.09$	$F(1,45)=.948, p=.335$ partial $\eta^2=.021$	$F(1,88)=4.691, p=.033$ partial $\eta^2=.051$
Muscle pain Frequency	$F(1,43)=1.92, p=.17$ partial $\eta^2=.04$	$F(1,45)=4.438, p=.041$ partial $\eta^2=.090$	$F(1,88)=.087, p=.769$ partial $\eta^2=.001$
Muscle pain Severity	$F(1,43)=5.51, p=.02$ partial $\eta^2=.11$	$F(1,45)=.025, p=.876$ partial $\eta^2=.001$	$F(1,88)=3.647, p=.059$ partial $\eta^2=.040$
Joint pain Frequency	$F(1,43)=1.47, p=.23$ partial $\eta^2=.03$	$F(1,45)=.378, p=.542$ partial $\eta^2=.008$	$F(1,88)=.529, p=.469$ partial $\eta^2=.006$
Joint pain Severity	$F(1,43)=0.26, p=.61$ partial $\eta^2=.01$	$F(1,45)=2.705, p=.107$ partial $\eta^2=.057$	$F(1,88)=1.627, p=.205$ partial $\eta^2=.018$
Fever Frequency	$F(1,43)=8.57, p=.005$ partial $\eta^2=.17$	$F(1,45)=.197, p=.660$ partial $\eta^2=.004$	$F(1,88)=8.327, p=.005$ partial $\eta^2=.086$
Fever Severity	$F(1,43)=9.28, p=.004$ partial $\eta^2=.18$	$F(1,45)=.197, p=.660$ partial $\eta^2=.004$	$F(1,88)=3.219, p=.076$ partial $\eta^2=.035$
Chills Frequency	$F(1,43)=10.53, p=.002$ partial $\eta^2=.20$	$F(1,45)=.338, p=.564$ partial $\eta^2=.007$	$F(1,88)=9.003, p=.004$ partial $\eta^2=.093$
Chills Severity	$F(1,43)=9.14, p=.004$ partial $\eta^2=.18$	$F(1,45)=.011, p=.916$ partial $\eta^2=.000$	$F(1,88)=4.588, p=.035$ partial $\eta^2=.050$
Unrefreshing sleep Frequency	$F(1,43)=13.95, p=.001$ partial $\eta^2=.25$	$F(1,45)=3.140, p=.083$ partial $\eta^2=.065$	$F(1,88)=4.730, p=.032$ partial $\eta^2=.051$
Unrefreshing sleep Severity	$F(1,43)=9.58, p=.003$ partial $\eta^2=.18$	$F(1,45)=1.494, p=.228$ partial $\eta^2=.032$	$F(1,88)=4.010, p=.048$ partial $\eta^2=.044$